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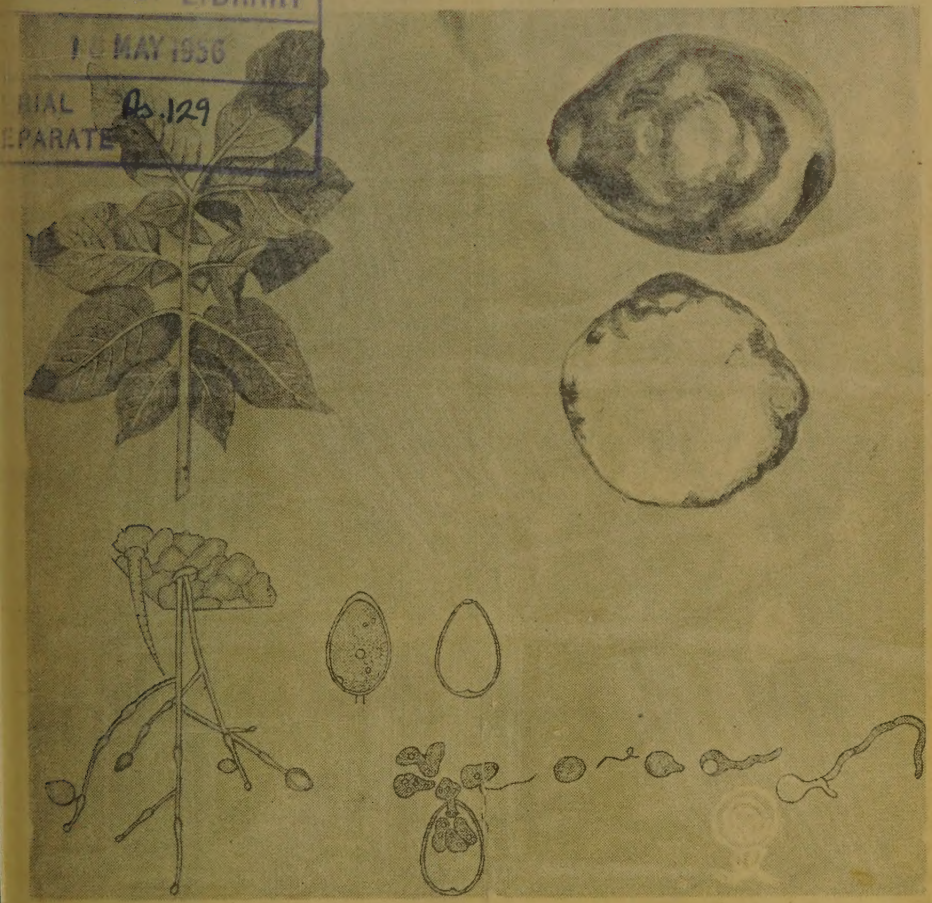
DIRECTORATE OF PLANT PROTECTION, QUARANTINE & STORAGE
MINISTERY OF FOOD AND AGRICULTURE, GOVERNMENT OF INDIA

PLANT PROTECTION BULLETIN

SCIENCE IN PRACTICE



LATE BLIGHT OF POTATO (*Phytophthora infestans* Mont. de Bary)

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ISSUED BY THE PLANT PROTECTION ADVISER TO THE GOVERNMENT OF INDIA
NEW DELHI.

NOTE

Plant Protection Bulletin is intended to keep all Plant Protection workers in India informed of the progress of control work on plant pests and diseases in different parts of the country and of the advances and developments in Plant protection work in other parts of the world. Suitable articles, reports, notes, observations and comments received from workers all over India will be published in the Bulletin. The notes from correspondents may also be in the form of suggestions, queries and opinions, even tentative, offered for discussion or consideration. The reports should in particular, contain information on the sudden outbreak of diseases or insect pests or the equally sudden disappearance of other diseases or pests from a particular area. The progress made in spraying, dusting and other methods of disinfestation should form a prominent part of the report. The intensity and severity of a disease or pest, and the prevalent conditions should be noted. If some varieties of a crop are not affected by a disease or pest, whereas others occurring in the vicinity have been attacked by them, then such information would be extremely useful. In reports containing control operations against pests and diseases, the cost of these operations and the savings obtained therefrom must be invariably stated. In accepting and publishing any material received from contributors, the Directorate of Plant Protection, Quarantine and Storage serves merely as an informational clearing house. It does not assume responsibility of the subject matter.

Any suggestions for the improvement of this Bulletin will be gratefully received.

K. B. LAL

Plant Protection Adviser to the Govt. of India.

CONTENTS

Activities of the Directorate of Plant Protection, Quarantine & Storage During 1953 *

I. Locust Control

LOCUSTS continued to constitute serious threats to India and necessitated preparations to fight them on the same scale as in 1952. A few swarms over-wintered in India but gradually dispersed and finally disappeared by the first week of February, 1953. The expected incursion of locust swarms from the west commenced about the middle of May and continued till the end of September, during which period about 150 swarms crossed the Indo-Pakistan border into India. During May, the swarms reached as far as Eastern Pakistan but by the middle of June westward migrations of the swarms had begun. The locusts roamed about in the States of Rajasthan, Punjab, PEPSU, Jammu & Kashmir, Uttar Pradesh, Himachal Pradesh, Madhya Pradesh, Bhopal, Madhya Bharat, Vindhya Pradesh, Kutch, Bombay, Bihar, Orissa and West Bengal.

Egg-laying started early in July in Rajasthan, Punjab and PEPSU and extended to Ajmer, Delhi and Uttar Pradesh during the second fortnight, the activity continuing till the middle of October. The area infested with locust hoppers in the scheduled desert tracts of India was about 46,000 square miles and a gross area of 11,000 square miles was similarly infested in the cultivated areas of Rajasthan, PEPSU, Ajmer, Delhi and Uttar Pradesh.

Control operations were organised successfully by the Directorate of Plant Protection, Quarantine & storage in the desert breeding areas and by the States concerned in their respective territories with the result that hardly any swarm was allowed to develop in any part of India. In the scheduled desert areas, about 1,600 tons of BHC dust were used and an aggregate of about 1,500 miles of trenches were dug to destroy locusts. Some small scale operations from the air were also undertaken and some egg-infested grounds were sprayed with aldrin with good results. In addition, settled locust swarms were poison-dusted or otherwise destroyed by burning, baiting and crushing on many occasions in Rajasthan, Punjab, PEPSU, and Uttar Pradesh.

II. Plant Protection

The Directorate continued to assist the States in fighting pest and disease epidemics by giving advice about the methods of control, the selection of pesticides, plant protection equipment and personnel as well as by deputing its officers to the States to help personally. Another of its activity was to test pesticides and plant protection machines available in the Indian market. About 20 pesticides were tested against various insect pests and field rats under field conditions. BHC, as dust or spray, appeared superior to and cheaper than Chlordane, Toxaphene and Parathion against Pyrilla and grasshoppers. Parathion was effective against such pests as are protected by waxy coverings or scales, for example, mealy bugs and scale insects. As was expected, proprietary nicotine preparations proved more effective than home-made tobacco decoction against aphids, jassids and other sucking insects. Pyrethrum products, though effective, were expensive to use. Four weedicides were also tried against

*Extract from Resume of Annual Report of the Directorate of Plant Protection, Quarantine & Storage, Ministry of Food & Agriculture, New Delhi, for 1953.

several of the common weeds occurring in various parts of India but the results were not conclusive.

Field demonstrations of control operations against various pests and diseases of food and vegetable crops, over a total area of about 200 acres, were given in some villages in Delhi State, selected for development under a Rural Development Scheme of the Indian Council of Agricultural Research. Likewise, assistance was provided for spraying about 3,200 citrus trees, affected with various diseases, and for treating wheat and other seeds, to cover over 116 acres, against seed-borne diseases and about 80 acres of wheat, pea and vegetable crops against other diseases, under the same scheme. About 231 acres of paddy crop, attacked by the gundhy bug at the Government Cattle-cum-Dairy Farm, Karnal, were dusted, about 750 maunds of grains stored by cultivators were fumigated and 200 storage godowns were disinfected. Control measures were adopted against field rats over an area of about 225 acres involving the poison baiting of about 3,000 rat burrows.

III. Plant Quarantine

Plant quarantine work is designed to prevent the introduction of foreign plant diseases and pests into India. At the sea-port of Bombay, 89 consignments, containing about 2,00,000 plants, etc., and 28 tons of seed potato were examined and released; 29,890 bales of American cotton and 67,402 lbs. of tobacco were inspected and fumigated or otherwise suitably treated against the entry of pests and diseases. Some consignments, found carrying insects, mites or plant diseases, were intercepted and destroyed. At the sea-port of Madras, 1,025 bales of American cotton and ten consignments of 5,150 mulberry seedlings and rose cuttings, etc., and various seeds were inspected and suitably treated. At the air-port of New Delhi, 488 packets of various seeds imported by air were inspected and suitably treated. In addition, 433 planting materials, imported by air from various countries were also examined, suitably treated and released under instructions from the Ministry of Food & Agriculture. Plants and seeds intended for export from India by air were also examined, fumigated or otherwise treated and necessary phytosanitary certificates issued. Similarly steps were taken to prevent further spread of pests and diseases of plants from one State to the other. Special mention may be made of the accidental introduction of the serious disease of potato known as 'wart', hitherto unknown in India. The Directorate took prompt measures to destroy the disease harbouring crop in Darjeeling and to disinfect the soil of the field where the crop was raised.

IV. Plant Protection Information

The Directorate continued to maintain up-to-date records of information pertaining to pests, plant diseases and weeds and the methods of their control, the suitability of pesticides and plant protection machines and other equipment, techniques of plant protection work tried, evolved or improved in India or other countries, the problems involved in fighting pests and plant diseases, results of surveys of pest and disease incidences, etc. The information so collected was supplied or disseminated to specific parties or in general in various ways.

Toxicity Hazards of Modern Organic Insecticides Used in the Control of Insects

By

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New Delhi.

MOST pesticides are toxic. If they were not so, they would not control pests. Toxicity hazards of pesticides may be associated with the manufacture of their primary active ingredients, with their formulation into material for field use and with their application. Residue hazards also exist. In India on account of the lack of experience in the manufacture and formulation of poisonous pesticides, care should be taken to ensure that (i) the plants are of a type that would not expose workers to undue risks, and (ii) the manufacturers are well equipped to handle toxic chemicals and that the workers in the factory are kept under observation for any general reduction in the blood cholinesterase and other toxic effects. Even in factories manufacturing or formulating DDT and BHC, measures of industrial hygiene should be introduced. For the control of hazards at the time of application, in most advanced countries registration of pesticides is resorted to by enacting Pesticides Act to ensure proper labelling of containers so as to include adequate warnings of dangers, how they may be avoided and instructions for proper antidote and first-aid treatment in case of accidents. Facilities for the medical treatment of workers in the field should be made available. DDT and BHC have been applied by hand or by simple manually operated equipment relatively safely but caution is needed in the introduction of more toxic pesticides. Protective equipment should be used as far as possible. Mechanically operated ground equipment having gas tight cabins for the protection of the operator should be introduced into India. Use of aircraft for applying pesticides is becoming popular in some countries but there have been a number of accidents due to pilots becoming affected by the pesticides. Special care should, therefore, be taken for designing aircraft suitable for the work. Special steps must be taken to clean machines used for toxic pesticides and to see that persons handling them for this purpose are made aware of the hazards. Restrictions are also necessary so that application of sprays and dusts do not result in the contamination of people and domestic property with material intended for protection of crops. Care must also be taken to see that there is sufficient interval between application of pesticides and harvesting, cultivation or any other similar attention. There is a possible risk to health from the ingestion of small quantities of pesticides in food but there is no evidence that anyone has suffered illness from this cause. Until further research and observations are made, residue hazards may be reduced by (i) correct application using proper dosage, (ii) allowing sufficient time before harvest, (iii) enacting Pure Food Law so as to ban the sale of any food containing any pesticide and permitting limits or tolerances for residues and (iv) developing methods of chemical analysis of food as a means of providing evidence of contamination.

A number of modern herbicides, fungicides, molluscocides and rodenticides are toxic like the organic insecticides and should be handled with as much care.

In spite of their toxicity hazards, modern pesticides have had a fine safety record of use both in the home and in the field when even chemicals and materials commonly used like aspirin, petroleum products, furniture polish, lye, etc., have caused a number of deaths. In any case to prevent accidents, modern pesticides should be used in prescribed dosages and with necessary precautions. To maintain this safety record, besides educating the public in the proper use of pesticides, in most of the advanced countries Pesticides Acts have been enacted so as to regulate the import, manufacture or sale of pesticides.

Antidotes for Pest Control Chemicals
For Use in Case of Poisoning *

Regardless of the toxicity of a pest control chemical, it will injure no one if the hazards of its use are guarded against by carefully planned methods of operation. In order that precautions can be taken seriously, it is essential that employees, supervisors, and management know what the possible hazards of each pesticide are and have a general knowledge of what should be done in case of accidental poisoning. The most important rule, is, *In Case of Poisoning Call on A Physician or An Emergency Hospital Immediately.*

General Recommendations

There are general recommendations which can be made, principles to be followed until the doctor arrives or the person can be taken to a hospital.

If the poison can be removed safely from the stomach or other surfaces of the body before it is absorbed, the harm done to the patient will be minimized. Once the poison is absorbed into the body much less can be done with any treatment.

General treatment promptly given is often more effective than the use of specific measures given after some delay.

Until The Doctor Arrives

While awaiting arrival of the physician you have called, apply the following measures:

If the poison has been inhaled, remove patient to the open air. If breathing has stopped, give artificial respiration.**

If poison has been spilled on the skin, wash off immediately and thoroughly with large amount of warm, soapy water.

If droplets or particles of poison have entered the eyes, flush thoroughly with water.

If the poison has been swallowed, empty the stomach as soon as possible. If the patient is vomiting, give large amount of warm water. If an emetic is needed, give warm salt solution (one table-spoon in a glass of water), repeating

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*Extract from "Pest Control" January, 1953, pp. 9, 10 and 12

**The California State Board of Pharmacy, in its "Official Antidotes" January 1, 1952, says this about artificial respiration : "Avoid harmful forced methods of artificial respiration. Use inhalation apparatus with face mask and rubber balloon to provide a rhythmic intake of oxygen at about 20 inspirations per minute, or place patient on a stretcher or board supported in centre and rock at 45 degree angle at the same rate. As an alternate method, apply gentle pressure on lower ribs intermittently, with head turned toward the side and supported by the arm. Keep air passages open. Avoid vigorous application of pressure to the chest. Rectum may be dilated manually to stimulate respiration. The procedures described are less harmful and more effective than the use of the pulmotor." The "Back Pressure—Arm Lift" method has been approved by the American National Red Cross. A pamphlet describing this method of artificial respiration may be obtained from this organization.

until the vomit fluid is clear, or give three teaspoonfuls of powdered mustard in a glass of warm water. Vomiting can also be induced by gently stroking or touching the inside of the throat with the finger or a tongue depressor when the stomach is full of liquid.

Do not use an emetic if a corrosive acid or caustic alkali has been swallowed, since perforation of an eroded oesophagus or stomach may occur.

After the stomach has been emptied as completely as possible, give a demulcent such as raw egg white mixed with water, 10 to 20 grams of gelatin dissolved in a pint of warm water, flour and water, or milk.

Universal Antidote

Activated Charcoal 2 parts, Magnesium Oxide 1 part, Tannic Acid 1 part, in a mixture and given as 15 grams (½ ounce) in a half glass of warm water may be used to absorb or neutralize poisons. This mixture is useful in poisoning by acids, alkaloids, glycosides, and the heavy metals. Except after corrosive substances it is to be followed by gastric lavage or an emetic.

Lavage is the most important method for removal of poisons from the stomach. Serious injury may result from improper use of a stomach tube and this procedure should be carried out by a physician. Ordinarily, gastric lavage is not indicated unless the patient is seen within the first four hours after the poison has been swallowed.

General Methods To Prevent Collapse

1. Cover with a light blanket. Do not use a hot water bottle.
2. Raise foot of bed. Apply elastic binders to arms and legs.
3. Give strong tea or coffee. Tea is useful for children. Do not exhaust patient by too much or too vigorous treatment.

Antidotes For Some Economic Poisons*

For some specific poisons, the following emergency treatments are preferable while awaiting physician:

Aldrin: Empty stomach. Have patient lie down and keep quiet. Physician should administer phenobarbital immediately and repeat as often as symptoms require.

ANTU: Give an emetic and keep patient quiet.

Arsenic Compounds: (calcium arsenante, lead arsenate, magnesium arsenate, paris green, arsenious oxide, sodium arsenate, sodium arsenite)—Empty stomach. Then give 2 table-spoonfuls of Epsom salt or milk of magnesia in water, and plenty of milk and water. Have patient lie down and keep quiet.

Barium Carbonate: If patient has taken this poison within 24 hours, give him one teaspoonful of mustard in a glass of warm water. If he has taken the poison longer than 24 hours before treatment, give him one tablespoonful of Epsom salt dissolved in a glass of water. Call a doctor as soon as possible.

*As plant protection workers in India have usually to work far away from places where medical attention could be obtained, it would be advisable for them to take prescribed antidotes in a 'first aid' bag for use in case of emergency. —Editor

Benzene Hexachloride: Empty stomach. Then give hot coffee or tea, and two tablespoonfuls of Epsom salt. Avoid oil cathartics or giving other fatty substances. Physician may administer phenobarbital.

Chlordane: Same as benzene hexachloride.

Cyanides : (Acrylonitrile, calcium cyanide, liquid hydrocyanic acid, potassium cyanide, sodium cyanide). Carry patient to fresh air. Have him lie down. Remove contaminated clothing but keep him warm. Start treatment immediately. Break an amyl nitrite pearl in a cloth and hold lightly under nose for 15 seconds. Repeat 5 times at about 15 second interval. Give artificial respiration if breathing has stopped. If cyanide is swallowed and if patient is conscious or when consciousness returns, give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear.

DDT : Same as benzene hexachloride.
Dieldrin : Same as aldrin.

Flourides soluble in Water : Give gastric lavage with lime water or 1% calcium chloride solution. Give 10 cc. (2½ teaspoonfuls) of 10% calcium gluconate solution intramuscularly. 5% carbon dioxide in oxygen inhalation or artificial respiration if necessary. Demulcent drinks and external heat.

Hexaethyl tetraphosphate : See Parathion.

Kerosene : If inhaled, promptly remove from exposure and give 5% carbon dioxide or artificial respiration if necessary. It is now considered that if gastric lavage is attempted, it should be done as a precaution against regurgitation and aspiration, rather than to prevent absorption from the gastro-intestinal tract. Oil laxatives should not be used.

Mercury Compounds : [Inorganic salts (except calomel) and metallic mercury].

Give milk, or white of egg beaten with water, then give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Repeat milk or white of egg beaten with water. Organic mercury compounds vary so widely in their properties that they must be considered individually by the physician.

Methoxychlor : Probably little harm will be done if the material is swallowed. Removal of the insecticide from the stomach and intestinal tract is about all that should be necessary. Oil cathartics should be avoided.

Parathion : If the skin is contaminated, wash thoroughly with soap and water. If swallowed, empty stomach with emetic. Give patient two 1 100 grain atropine tablets and call a physician. The physician may give 1/30 to 1/60 grain of atropine at hourly intervals, until pupils dilate ; or total dose of 19.5 mg. per day, if necessary, to control respiratory symptoms.

Pentachlorophenol : In case of contact, immediately wash skin with soap and plenty of warm water ; for eyes, flush with plenty of water for at least 15 minutes and get medical attention. Remove and wash clothing before reuse. In case of accidental swallowing, induce vomiting by administering mustard and water or other emetic. Call a physician.

Phosphorous : Give 1% copper sulfate solution which must be followed by gastric lavage with 1 quart of 1% sodium bicarbonate solution. Give 120 cc.

(4 ounces, or half cup) liquid petrolatum as a demulcent. Do not use animal or vegetable fats or oils. Later, treatment for liver damage with high carbohydrate diet.

Pyrethrum : Since household preparations contain the equivalent of about 100 mg. of pyrethrins per 100 cc. of kerosene, any toxic effects following the inadvertent swallowing of this solution would be due to the ingested kerosene. Gastric lavage is about all that can be recommended.

Sodium Fluoroacetate (1080) : There is little evidence of the effectiveness of any antidotal measure for this poison; however, the following interim recommendations are made (Speed is essential): (1) Give one tablespoonful of table salt in a glass of warm water and repeat until vomit fluid is clear. (2) Call a doctor immediately. (3) Keep patient warm and quiet. Lavage of the stomach may be of some value even several hours after injestion of the poison. After stomach lavage, administer orally 4 cc. per kg. (body weight) of an equal mixture of 50% ethyl alcohol (whisky) and 5% acetic acid (vinegar), or either one alone if both are not available. (That is 6½ ounces for a person weighing 110 lbs.; 9 ounces for a person weighing 154 lbs.; or 13 ounces for one who weighs 220 lbs.). This may be repeated in 3 or 4 hours if necessary or smaller doses may be given at more frequent intervals. Most important : Call a physician immediately.

Strychnine and its salts : If less than 10 minutes have passed since the poison was taken, give a tablespoonful of salt in a glass of warm water. Have the patient lie down in a quiet, darkened room and keep him warm. Call a physician immediately.

Tetraethyl Pyrophosphate : Same as Parathion.

Thallium : Give patient one tablespoonful of table salt (iodized if possible) in a glass of warm water. Give one standard emetic. Be sure patient vomits freely and then give him another dose of table salt.

Toxaphene : Same as benzene hexachloride.

Warfarin : When warfarin bait is known to have been taken once, patient should be placed under observation for 24 hours and fed milk. When warfarin bait has been taken several times in the course of two or more days, intravenous Vitamin K in large doses should be given by a physician. Menadione, Vitamin K1, natural Vitamin K and the water soluble forms of menadione are all suitable for use as antidotes. If patient has taken considerable amount of warfarin bait over a period of days and then shows frank haemorrhage, immediate fresh whole blood transfusion is indicated along with the administration of massive doses of Vitamin K2.

Zinc Phosphide : If patient has taken poison within 24 hours proceed as follows: (1) Stir one teaspoonful of mustard into a glass of warm water and let patient drink; (2) after vomiting from treatment (1) has stopped, have patient drink a solution consisting of potassium permanganate made by dissolving one 5 gr. potassium permanganate tablet in a glass of warm water; (3) 10 minutes after treatment (2), have patient drink a solution made of 1/2 teaspoonful of copper sulphate in a glass of water; and (4) 15 minutes after treatment (3) give patient a solution made by dissolving 1 tablespoonful of epsom salt in a glass of water. If the poison has been taken longer than 24 hours, omit treatment (1) above and give the others in order.

Diseases Can Destroy Insects *

THE Agricultural Research Service of the U. S. Department of Agriculture (USDA) is stepping up its search for diseases that will destroy insects. Entomologists look hopefully to this field of basic research for help on the growing problems of insect resistance and toxic residues stemming from increased use of insecticides.

Residues would seldom be a problem in control of insects by disease because most insect diseases are harmless to man, animals, and plants. Furthermore, these diseases generally kill a single species without harming others; many insecticides kill both pests and beneficial insects.

Although disease is probably the least exploited of all control methods, entomologists see in recent successes evidence of a promising future.

Milky disease of Japanese beetle, developed by USDA and first used as a soil treatment in 1939, is now on the market throughout the beetle-infested eastern United States. The bacteria have been dusted over millions of acres to destroy the root-feeding grubs and halt the emergence of the foliage and flower-feeding adult Japanese beetles.

Alfalfa caterpillar disease, developed by University of California scientists, was proved in the field in 1948. Since then, the virus has been used successfully by growers to control this alfalfa pest.

A virus spray brings on the newest promising disease for insect control. This disease was developed in Canada and used experimentally by USDA entomologists in 1951 against the European pine sawfly. Applications on New Jersey and Illinois pine stands gave excellent results.

To this vast and practically unexplored field of bacterial and virus diseases can be added many more diseases that are caused by equally important protozoan, nematode, rickettsia, and fungus organisms.

It has been less than two years since an insect-disease laboratory was established at the Agricultural Research Centre, Beltsville, Maryland, under the leadership of S. R. Dutky. Work there has already uncovered many insect diseases not heretofore isolated and described. Three of them look especially promising: a virus disease of armyworms, a fungus disease that is lethal to several insects, and a bacterial disease of the pink bollworm.

The armyworm virus, under test in the field this summer, was collected during the 1953 armyworm outbreak in Maryland fields. The disease apparently spreads naturally and was an important factor in ending ravages of these pests in many areas.

The fungus disease was first noted in Russia in 1879 but has been studied little since then. Preliminary laboratory screening shows this fungus to be deadly to grubs of Japanese beetles, larvae of honey bees and wax moths, and adults of the Mexican bean beetle and the house fly. Mixing the disease with talc and puffing it over adult flies resulted in their death within 4 to 6 days.

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*Extract from *American Agriculture*, No. 54-A-7, July 15, 1954, pp. 13 & 14.

Honey bee larvae were killed in the laboratory in less than 24 hours, but the disease proved completely ineffective when tested at active bee-hive temperature.

Here's the plan the researchers follow in evaluating diseases of insects sent to the laboratory:

First, a diagnosis shows if disease is present. If so, it's isolated. Then, the disease is screened to find its effect on other insects. Finally, methods are developed for propagating sufficient quantities of promising diseases for large-scale testing.

Dutky has speeded up screening with a microinjection technique. Incubation rooms help maintain and propagate the disease under controlled temperature and humidity. Even so, a number of laboratory problems still remain.

It must be kept in mind that such factors as temperature, moisture, and the life span of some of the organisms may limit their use for insect control. Unlike milky disease, which can be stored 13 years or more, many of the diseases are short lived. Others, like the fungus disease that kills bees in the laboratory but not in the hive, will have to be used when temperature and humidity are just right. Tests now under way may help us deal with a number of these problems.

Plant Quarantine Regulations of Pakistan *

Legislation

The Destructive Insects and Pests Act, 1914 (as adopted by the Government of Pakistan).

Rules for Regulating the Import of Plants, etc., into Pakistan.
Notification No. F. 320/35-A, 20 July 1936.
Notification No. F. 11(1)/48-CS, October 1948.
Notification No. F. 3-52/48-CS(I), 23 March 1949.
Notification No. F. 3-52/48-CS(II), 24 March 1949.
Notification No. F. 11-3/49-CS, 19 January 1950.
Notification No. F. 8(1)/50-CSI, 4 April 1950.
Notification No. F. 9-17/50-CS, 24 July 1950.
Notification No. F. 3-77/50-CS, 26 October 1950.

Importation prohibited

1. *Unginned cotton.* Importation by sea or by air is prohibited.

2. *Coffee plants, seeds and beans.* Importation is prohibited except with the special permission of the Director of Plant Protection, Government of Pakistan. Provided that the prohibition shall not apply : (1) to roasted and ground coffee, or (2) to a consignment of unroasted or unground coffee beans of seeds produced in India or in Burma and covered by a certificate of origin (3) Mexican jumping beans (*Sebastiania palmeri*) (4) Sugarcane from Fiji Islands, New Guinea, Australia or Philippine Islands.

Restrictions on means of transportation

1. Importation of plants by means of letters or sample post prohibited.

2. Importation of plants by air prohibited; except the plants used for the introduction of living insects when accompanied by a special certificate from the Director of Plant Protection, Government of Pakistan. Provided that plants may be imported in special cases under a permit from the Director, Plant Protection Department, Government of Pakistan, and subject to the conditions laid down by him.

Fumigation required

No plants other than fruits and vegetables for consumption, potatoes, sugarcane and unmanufactured tobacco either raw or cured, shall be imported by sea except after fumigation with hydrocyanic acid gas at a prescribed port ; except the plants used for the introduction of living parasitized insects if accompanied by a certificate from the Director of Plant Protection, Government of Pakistan.

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* Extract from *Digest of plant Quarantine Regulations, F. A. O., Rome, Italy*—December, 1952, pp. 113—116.

Certificate required

No plants other than unmanufactured tobacco from Burma, fruits and vegetables for consumption, and potatoes shall be imported by sea unless accompanied by an official certificate indicating freedom from injurious insects and diseases granted by the proper officer or authority in the country of origin in the prescribed form. (Schedule I of the Rules for Regulating the Import of Plants, etc., lists of the names of proper officers and authorities of 56 countries).

Importation restricted

Besides the general health certificate mentioned above, the importation of the following materials are further restricted by additional requirements. (Importation of potatoes does not require the general health certificate).

1. Potatoes (except from Burma). Must be accompanied by an official certificate declaring: (i) that the potatoes were grown and shipped from a place free from the wart disease (*Synchytrium endobioticum*), golden nematode (*Heterodera rostochiensis*) and Colorado beetle (*Leptinotarsa decemlineata*), and that no case of these diseases was recorded in 12 months preceding the date of the certificate within 5 miles of the place; and (ii) that the crop from which the consignment is derived was inspected by an official of the Phytopathological Service of the country of origin and found free from all injurious diseases and insects. Potatoes may be imported from Italy if accompanied by a certificate of freedom from disease from a Royal Phytopathological Institute in Italy.

2. Rubber plants and seeds. Must be accompanied by an additional official certificate that the estate on which the plants have originated, or the individual plants are free from *Fomes lignosus*, *Sphaerostilbe repens*, *Dothidella ulei* and *Oidium heveae*.

3. Lemon, Lime, Orange, Grapefruit or other citrus plants and cuttings. Require an additional official certificate that they are free from the Mal Secco caused by *Deuterophoma tracheiphila* or that the disease does not exist in the country in which they were grown.

4. Unmanufactured tobacco, raw or cured (except from Burma). Require an official certificate that it is free from *Ephestia elutella*, or that this pest does not exist in the country of origin.

5. Sugarcane, from countries other than Fiji Islands, New Guinea, Australia, or Philippine Islands. Must be accompanied by an official certificate that it has been examined and found free from cane borers, scale insects, white flies, root diseases, pineapple disease (*Thielaviopsis paradoxa*), sereh and cane gummosis, that it was obtained from a crop which was free from mosaic disease and that the Fiji disease of sugarcane does not exist in the country of export.

6. Seeds of flax, berseem and cotton. May not be imported by letter or sample post, or otherwise than by sea.

7. Seeds of flax, berseem (Egyptian clover). Must be accompanied by a licence from a Department of Agriculture in Pakistan.

8. Cotton seed shall not be imported by sea save for experimental purpose by designated officers in Pakistan at the ports of Karachi and Chittagong under specific conditions. Provided that, if the cotton seed is accompanied by

a certificate from a Government Entomologist of the country of origin to the effect that the seed and its container have been treated in such a way as to destroy all insect life, the seed shall be examined on importation by such an officer as the Governor-General in Council may appoint and shall not require to be refumigated unless such examination shows that refumigation is necessary.

9. Cotton produced in any part of America. Importation is prohibited through the ports of Karachi or Chittagong and subject to prescribed conditions, including (a) that the consignee should furnish required information to the Port Authorities not less than 14 days before the arrival of the ship, and (b) the cotton shall be disinfected at Karachi or Chittagong in the prescribed manner.

Prescribed ports of entry

Karachi and Chittagong.

Packing material

All provisions referring to plants or seeds shall also apply to all packing material.

Rules Made by the Government of India for Regulating the Import and Transport of Plants Likely to carry San Jose Scale (*Quadraspidiotus perniciosus* Comstock)

The following are the two notifications issued by the Government of India to prevent the spread of San Jose Scale in the country :—

No.F.6-7/52-Dte.I-(II)

Government of India

Ministry of Food and Agriculture (Agri)

New Delhi, the 5th February 1953

NOTIFICATION

(Agriculture)

In exercise of the powers conferred by sub-section (1) of section 3 of the Destructive Insects and Pests Act, 1914(II of 1914) and in supersession of the rules published with the notification of the Government of India in the late Education Health and Lands Department No. F.50-13(21) 39-A dated the 20th November 1940, the Central Government hereby makes the following rules for the purpose of regulating the import into India of certain articles which are likely to carry the destructive insect known as San Jose Scale (*Quadraspidiotus perniciosus*) and thereby cause infection to crop, namely :—

1. In these rules, "infected area" means the State of Jammu and Kashmir.

2. The articles to which these rules apply are :—

(a) the following plants, namely, *akik*, alder, almond, apple, apricot, beech, bhang, birch, crab-apple, celtis, cherry, chestnut, currant, elm, eucalyptus, grape vine, green gage, hawthorn, lilac, mountain-ash, mulberry, oak, peach, pear, persimmon, poplar, plum, quince, raspberry, rose, strawberry, walnut and willow ;

(b) the following plant materials namely, buds, cuttings, scions, grafts, bulbs, leaves, seedlings, tubers, and rhizomes of the plants specified in clause (a), and

(c) any article used in packing or wrapping up any of the plants and plant materials mentioned in clauses (a) and (b).

Provided that these rules shall not apply to the fruits of the plants mentioned in clause (a).

3. No article to which these rules apply shall be imported from the infected area into India by land except by the Srinagar—Jammu—Pathankot road.

SCHEDULE

This is to certify that the living plants/plant materials included in the consignment of which particulars are given were thoroughly examined on ....(date) by..... (name and designation of official)..... ..... a duly authorised official of the..... (name of Department) .....and that the consignment including the packing covered by this certificate has been adequately treated and fumigated with hydrocyanic acid gas, methyl bromide or ethylene dibromide immediately prior/ subsequent to inspection and made free from living San Jose Scale.

Date of examination and fumigation.....
Particulars of consignment.....
Number and description of packages.....
Distinguishing marks.....
Description of living plants or plant materials.....
Exported by.....
Name and address of the consignee.....
Signature of certifying authority*.....
Designation .....

*Note :—The above certificate should be signed—

(a) in Kashmir, by the Director of Agriculture, Kashmir or such other officer or officers as may be authorised by the Kashmir Government in this behalf.

(R.L. Mehta)
Deputy Secretary to the Govt. of India.

No.F.6-7/52-Dte.I(I)
Government of India
Ministry of Food and Agriculture (Agri)
New Delhi, the 5th February 1953

NOTIFICATION

(Agriculture)

In exercise of the powers conferred by sections 4A and 4D of the Destructive Insects and Pests Act, 1914 (II of 1914), and in supersession of the rules published with the notifications of the Government of India in the late Education, Health and Lands Department Nos. F.50-13(20)/39-A and F.50-13)21)/39-A, dated the 20th November 1940, the Central Government hereby makes the following rules for regulating the transport from the States of Punjab, Uttar Pradesh, Madras, West Bengal, Assam, Orissa, Himachal Pradesh and Patiala and East Punjab States Union to any other State in India of certain articles which are likely to carry the destructive insect known as San Jose Scale (*Quadraspidiotus perniciosus*) and thereby cause infection to crop, namely :—

1. In these rules, 'infected area' means the States of Punjab, Uttar Pradesh, Madras, West Bengal, Assam, Orissa, Himachal Pradesh and Patiala and East Punjab States Union.

2. The articles to which these rules apply are —

(a) the following plants, namely *akik*, alder, almond, apple, apricot, beech, bhang, birch, crab apple, celtis, cherry, chestnut, currant, elm, eucalyptus, grapevine, green-gage, hawthorn, lilac, mountain ash, mulberry, oak, peach, pear, persimmon, poplar, plum, quince, raspberry, rose, strawberry, walnut and willow ;

(b) the following plant materials namely buds, cuttings, scions, grafts, bulbs, leaves, seedlings, tubers and rhizomes of the plants specified in clause (a) and

(c) any articles used in packing or wrapping up any of the plants or plant materials mentioned in clauses (a) and (b).

Provided that these rules shall not apply to the fruits of the plants mentioned in clause (a).

3. No article to which these rules apply shall be transported from any infected area to any other area in India—

(a) by means of letter or sample post or by air ;

(b) by road except by such route as may be specified by the Government of any State to which the articles are transported or by any of the routes specified below :—

(i) *Chamba.* via Dalhousie, Pathankot ;

(ii) *Mandi.* 1. For Kulu valley and Inner and Outer Seraj via Oot to Kulu.
2. For the plains via Baijnath and Palanpur ;

(iii) *Suket.* 1. Via Bilaspur road to Rupar.
2. Via Mandi and Baijnath to Palanpur ;

(iv) *Balsan.* Via Fagu and Simla ;

(v) *Jubbal.* Via Theog to Simla ;

(vi) *Koti.* Via Koti-Simla ;

(vii) *Kumarsain.* 1. Kotgarh to Simla.
2. Via Fagu to Simla.

(viii) *Bhagat.* 1. Via Kalka and Ambala.
2. Via Simla.

(ix) *Bashahr.* via Kotgarh to Simla.

(x) *Hill tracts of Patiala East Punjab States Union.*
1. via Simla. 2. via Kalka—Ambala.

(xi) *Bangalore*— Madras-Road.

(xii) *Mysore.* — Satyamangalam Road.

(xiii) Mysore-Tellicherry (Manantody).

(xiv) Mysore-Gudalur Road.

(xv) Mysore-Cannanore (Via Virarajendrepet).

(c) or by a railway or inland steam vessel unless the consignment is

accompanied by a certificate in the form set forth in the schedule annexed to these rules and signed by the authority specified therein.

SCHEDULE

This is to certify that the living plants plant materials included in the consignment of which particulars are given below were thoroughly examined on.....(date) by.....(name and designation of official) a duly authorised official of the..... (name of Department) .....and the consignment including the packing covered by this certificate has been adequately treated and fumigated with Hydrocyanic acid gas, methyl bromide or ethylene dibromide immediately prior/subsequent to inspection and made free from living San Jose scale.

Date of examination and fumigation .....
Particulars of consignment.....
No. and description of packages.....
Distinguishing marks.....
Description of living plants or plant materials.....
Exported by.....
Name and address of the consignee.....
Signature of certifying authority *.....
Designation.....

* Note :— The above certificate should be signed—

(a) in the Punjab, by the Entomologist, Punjab Agricultural College, Ludhiana or such other officer as may be authorised by the Director of Agriculture, Punjab in this behalf ;

(b) in the Uttar Pradesh by the Entomologist to the Government of Uttar Pradesh or such other officer as may be authorised by the Government in this behalf.

(c) in the State of Madras by the Entomologist to the Government of Madras, Coimbatore or such other officer as may be authorised by the State Government in this behalf.

(d) in the State of West Bengal by the Entomologist to the Government of West Bengal or such other officer as may be authorised by the State Government in this behalf.

(e) in the State of Assam by the Director of Agriculture or such other officer as may be authorised by the State Government in this behalf.

(f) in the State of Orissa by the Director of Agriculture or such other officer as may be authorised by the State Government in this behalf.

(g) in Mysore by the Director of Agriculture or such other Officer or officers as may be authorised by the Government of the State in this behalf.

(h) in Himachal Pradesh by the Director of Agriculture or such other officers as may be authorised by the Government of the State in this behalf.

(i) in Patiala East Punjab States Union by the Agricultural Entomologist or such other officer as may be authorised by the Patiala East Punjab States Union Government in this behalf.

Notes and News

(i) Chlordane in the control of soil insects*

Five years' experiments by the Agricultural Research Service, U.S.D.A., have shown that "Chlordane" applied at the rate of 1% dust at 2-4 lb. per acre in the furrow at planting, increases the average yeild of cane crop from 21.3 to 24.1 tons/acre (increase 2.8 tons) and of sugar from 3,852 to 4,315 lb./acre (increase 463 lb.) The average cash return gained is $ 18, against an expenditure of $ 4.5. The residual effect in the second year appears even greater. The gain achieved by an application of 4 lbs./acre in the first year was 16% and in the second nearly 20%.

(ii) Import of harmful insects by aircraft**

The threat of import of harmful insects by aircraft is emphasised by the discovery of Fiji leaf hoppers, the vectors of Fiji disease on an aircraft which arrived in Hawaii from Fiji. Further a leaf hopper new to Hawaii, *Deltocephalus sonorus*, has been found in considerable numbers. It is common in the southern U.S. but is not known to attack sugarcane.

(iii) The toxicity of Phenyl Benzenesulphonate @ and some chlorinated derivatives towards eggs of certain tetranychid mites.

Certain chlorinated phenyl benzenesulphonates in current use for the control of mites infesting plants appear to function mainly as ovicides. 4-Chlorophenyl 4-Chlorobenzene-sulphonate and 2:4-dichlorophenyl benzenesulphonate have been selected as being the most effective by American workers, whereas 4-Chlorophenyl benzenesulphonate appeared to be the most ovicidal of the esters examined in Britain.

Kirby and Read have compared the ovicidal activities of phenyl benzenesulphonate and certain chlorinated derivatives towards the glass-house red spider mite, and of leaf permeation studies involving summer eggs of the fruit tree red spider mite.

4-Chlorophenyl benzenesulphonate was found by them to be at least as ovicidal as 4-Chlorophenyl 4-Chlorobenzenesulphonate : differences between the five most potent compounds were significant at LD_{50} level, but not at LD_{95} level. Phenyl 4-Chlorobenzenesulphonate and the esters containing three or four chlorine atoms were of low or negligible activity.

The ability of 4-Chlorophenyl benzenesulphonate to exert ovicidal action against eggs on the under surface of leaves after its application to their upper surfaces exceeded that of 4-Chlorophenyl 4-Chlorobenzenesulphonate and that of phenyl benzenesulphonate.

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*Extract from "Agricultural Abstracts." The International Sugar Journal, Vol. LVI, No. 667, p. 182, 1954.

Extract from "Cane Developments in Hawaii". **The International Sugar Journal, Vol. LVI, No. 667, p. 188, 1954.

@Extract from **J. Sci. Food Agric. Vol. 5, No. 7,** pp. 323-330, 1954.

Chlorination in the *para*-position of the phenyl ring of phenyl benzenesulphonate enhanced ovicidal action, whereas *para* chlorination in the benezenesulphonic ring reduced it greatly. The effects of *para*-chlorination in both rings do not appear to be merely a summation of the effects of chlorination in either ring.

(iv) Studies of the toxicity to worker honey bees* (Apis mellifera L.) of certain chemicals used in Plant Protection.

The toxicity of eleven chemicals used in plant protection has been investigated by Glynne Jones and Joan Connel. In the laboratory experiments conducted by these authors, the order of effectiveness as stomach and contact poisons was : parathion, TEPP, gamma BHC, dieldrin, aldrin, chlordane, o, o'-diethyl-o-ethylmercaptoethyl thiophosphate (constituent of Systox); toxaphene, TEPP and bisdimethyl-amino fluorophosphine oxide, toxaphene and the sodium salts of 2-4-D and MCPA; as residual films, dieldrin, aldrin, gamma BHC, parathion, chlordane and o,o-diethyl-o-ethylmercaptoethyl thiophosphate (constituent of Systox); toxaphene, TEPP and bisdimethyl-amino fluorophosphine oxide had no measurable effect; as fumigants, dieldrin, gamma BHC, aldrin, parathion and chlordane; the remainder had no measurable effect.

(v) Parasities from India to help fight against** the Pink Boll Worm in U.S.A.

Five species of parasitic wasps have been sent from India by G. W. Angelat, insect explorer of the Agricultural Research Service of the U.S. Department of Agriculture. Shipments include *Bracon brevicornis*, *Bracon gelechiae*, two unidentified species of *Chelonus* and one of *Apanteles*. These are being tried against the Pink Boll Worm in the Rio Grande Valley.

(vi) Chelates—Absorption and Translocation of Ethylene diaminetetraacetic acid by sunflower plants@

Chelating agents are coming into widespread use in agriculture for the prevention and cure of iron-deficiency chlorosis in plants. Little, however, is known about absorption, translocation, and metabolism of these materials by plants. This investigation was carried out in order to gain some information on absorption and translocation of ethylene diaminetetraacetic acid (EDTA), the most widely used of the chelates. Solution culture experiments with sunflower, employing the split-root technique, indicate that iron is absorbed by one portion of the split root growing in nutrient solutions adjusted to $_{p}$H 7.0, but is not utilized, resulting in iron-deficiency chlorosis. When ethylene diaminetetraacetic acid was supplied through the other portion of the split root, excellent plant growth was obtained, indicating that the chelate made iron available to all portions of the plant. It would be of considerable help for agricutural use to know whether the chelate transports iron to the root surface where only the iron is absorbed, or whether the whole chelated molecule is absorbed by the roots of plants.

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*Extract from **Ann. appl. Biol,** 41 (2), pp. 271-279, 1954.

Extract from **Agricultural Research", Dec., pp. 8-9, 1953.

@Extract from the **Journal of Agricultural and Food Chemistry,** II, 8, pp. 421-425, April 14, 1954.

(vii) Development of Fungicides in the U.S.A.*

In the U.S.A., the potential market for fungicides is estimated to be worth about $ 8 million per year. Despite the progress in recent years in the development of organic fungicides, an estimated $ 1.5 billion is lost each year to fungi. Rapid development of organic fungicides started about 1950 with the aggressive merchandizing of the phenyl mercuric fungicides and the quinones. Derivatives of the quinones were among the first of the modern organic fungicidal compounds; tetrachloro-p-benzoquinone, first marketed in 1940, occupies a position in this development analogous with DDT in the history of insecticides.

Present research and development in the field of fungicides seems to follow four general classes of organic compounds : the quinones, dithiocarbamates, heterocyclic nitrogen compounds, and mercuric salts of organic compounds.

The dithiocarbamates (ferbam, ziram, zineb and nabam) are among the oldest and most widely used of the synthetic organic fungicides. These materials are applied as foliage dusts and sprays to fruit and vegetable crops and are also used for fungicidal treatments of seeds.

Among the quinones, Chloranil (tetrachloro-p-benzoquinone) and Phygon (dichloronaphthoquinone) are used for seed-treatment and also foliage application.

Glyodin (2-heptadecyl gloxalidine acetate), Captan (N-trichloromethyl thiotetrahydrophthalimide), are examples of the heterocyclic nitrogen compounds. Glyodin is used extensively as a fruit fungicide for the control of apple 'scab' and cherry 'leaf-spot'. Captan is also used as a fruit fungicide and in addition is effective for control of apple 'blight' and 'late-blights' of tomatoes and potatoes.

The phenolic derivates are primarily mercury compounds, including phenyl mercuric acetate, phenyl mercuric urea, and mercuric cyanide.

The old stand-bys, sulphur, lime and copper compounds are still the leading fungicide materials on a weight basis. The biggest drawback at present to all fungicides is the fact that all are surface active agents. Weather conditions, rain and heavy dew wash the fungicides off the plant surface, and hot damp weather, of the type which is ideal for the growth of fungi, is also the most adverse for fungicides. The problem of re-application makes control programmes relatively time consuming and expensive. At present there is a great deal of interest in chemotherapeutics, analogous to the systemic insecticides. Ideally, these compounds would be absorbed into the plant system and, in this state, would surmount the present problems associated with weather and surface contact materials. Actidione, which has shown promise as a fungicidal agent, is not absorbed by the plant, but is rather another contact poison. Another problem is the soil fungi. As yet there has been little progress toward developing compounds which are effective against the fungi which attack the roots of the growing plant. The search for true therapeutic agents is under way and when developed, the market for fungicides will be comparable to the recent developments in insecticides. For the present, the use of the organics is confined largely to high income crops, orchards, truck gardens, and seeds. The development of effective chemical control for such diseases as wheat 'rusts' and potato 'blights' remains for research.

*Extract from the **Journal of Agricultural and Food Chemistry,** II, 6, pp. 294-295, March 17, 1954.

(viii) Herbicide development rapidly picking up speed*

Phenoxy-type compounds : This is the best known group of the herbicidal chemicals. This includes 2, 4-D (2, 4-dichlorophenoxyacetic acid), 2, 4, 5-T (2, 4, 5-trichlorophenoxyacetic acid) and MCP (2-methyl-4-chlorophenoxyacetic acid). Use of these compounds for the control of broad-leaf weeds and certain other plant species has been extensive. They have been used both as post-emergence and pre-emergence sprays. As pre-emergence agents they are effective for both broad-leaf weeds and grasses.

Silvex (2, 4, 5-trichlorophenoxypropionic acid) has been made available in limited quantities only during the past year. It is a product that is being watched with special interest. Tests have indicated that it is equal to 2, 4, 5-T for the control of certain specific woody plants. One of its most promising characteristics is its relatively low toxicity to cotton as compared with 2, 4-D or 2, 4, 5-T.

A new compound closely related to TCA (trichloroacetic acid) now has appeared on the scene. It is given the name 'dalapon'. Its chemical name is 2, 2-dichloropropionic acid. Recently put on the market, this new compound is more effective than TCA on many grasses and shows promise for the control of grasses and grass-type weeds.

Among the chlorinated phenoxyethyl esters, 2, 4-dichlorophenoxyethyl benzoate has been used in pre-emergence applications on soil and 2, 4- dichlorophenoxyethyl sulphate has been established and its derivates are being developed. One of these, sodium 2, 4, 5, trichlorophenoxyethyl sulphate, an example of a tailor-made herbicide, will be especially suited in weed control for tomatoes. Tomatoes are particularly sensitive to most herbicides but this one can be used with relative safety.

Dinitro Compounds: These have found extensive use as contact, selective and non-selective post-emergence herbicides. Two of the more important dinitro compounds are dinitro-o-(sec-butyl) phenol and dinitro-o-cresol. These also have been used as pre-emergence sprays on weeds in a number of crops, including cotton, peanuts and soyabeans. One of the problems with these compounds has been their volatility and relatively high vapour activity. A new development designed to overcome this difficulty is the use of as little as 50 pounds of lime per acre with these compounds. This reduces the volatility and, therefore, makes them safer to use. The lime is either applied in the spray mixture or applied separately to the soil surface immediately after the spray has been put on.

Carbamates: The best known among these are IPC (isopropyl-N-phenyl-carbamate) and CIPC [isopropyl-N-(3-chlorophenyl) carbamate]. They have been particularly useful as post-emergence sprays for the control of germinating annual grasses in legumes, and more recently as pre-emergence sprays for weed-control in cotton, soyabeans and certain other crops.

Substituted Ureas: They are the first organic chemicals to show sufficient stablity as soil sterilants to be satisfactory. The two best known of this group are CMU [3(p-chlorophenyl)-I-dimethylurea] and PDU [3-(phenyl)-I, I-dimethylurea]. They not only are good soil sterilants on non-agricultural lands, but also appear effective as pre-emergence treatments for weed-control in cotton, soyabeans and other large deep-seed ed crops. They have the ability to persist in the soil for long periods of time.

*Extract from the *Journal of Agricultural and Food C hemistry*, II, 6, pp. 293-294, March 17, 1954.

Efficient control of perennial weeds such as Canada thistle, Johnson-grass and nut-grass, is a problem. Wild oats is a serious menace, and an area of about 29 million acres in northern United States and Canada, is estimated to be seriously infested with this weed.

The cost picture speaks favourably for the use of herbicides. In the case of 2, 4-D, for post-emergence application for control of broad-leaf weeds in cereals, the cost of materials is 25-50 cents an acre. The only effective means now available for controlling weeds in some crops such as wheat, oats, barley and rice, is the use of chemical agents. The cost of using the best cultural Wd mechanical methods for controlling weeds in cotton is around $18.00 an acre. anith chemicals, this cost can be reduced to about $ 8.00 an acre.